Case Study	**City of Manitowoc Wastewater Treatment Facility** **Phosphorus reduction program**
Standard Industrial Classification (SIC)	Wastewater Treatment Facility, SIC 4900
Type of Waste	Phosphorus
Strategy	Surcharge to Encourage Phosphorus Reduction - The City hired an engineering firm to do a phosphorus removal study at the treatment facility, and an engineering firm to conduct a phosphorus source identification program for the entire City. The City of Manitowoc revised their sewer use ordinance by setting a phosphorus limitation of 20 mg/l (mass loading of 40 pounds per day). Also, the new ordinance required a surcharge of $278 per 100 pounds of phosphorus when discharged to the sewerage system in excess of 12 mg/l of phosphorus.
Company Background	The City of Manitowoc sewer service area contains a resident population of approximately 35,000. Manitowoc has a diverse industrial base. The manufactured products include cookware, aluminum boats, heavy construction equipment, steel furniture, refrigerators, a variety of fabricated metal products, and a variety of food and dairy products. Manitowoc's industries discharge about 35 percent of the total flow tributary to the publicly owned treatment facility. The City regulates 24 businesses through their state approved pretreatment program.
Original Process	The City of Manitowoc had been trying many options to control their high levels of phosphorus including the use of pickle liquor, alum, and ferric chloride. These treatments were not affective in reducing phosphorus levels to meet their new effluent limit for discharges to Lake Michigan.
Motivation	The City of Manitowoc has an effluent limit of 1.0 mg/l for phosphorus in their Wisconsin Pollution Discharge Elimination System (WPDES) permit. A Notice of Violation letter was sent to the City of Manitowoc on March 31, 1987 for reported violations of this phosphorus limit. On April 14, 1987 the Department of Natural Resources held an enforcement conference with the City of Manitowoc to discuss the City's violations of phosphorus limits. The City of Manitowoc had exceeded its phosphorus limit 20 out of 24 months during the period between 1985 - 1986. It was agreed that the City needed to take action on controlling its effluent quality. The Department requested that the City of Manitowoc submit, by May 31, 1987, a report on how the City would regain compliance with its WPDES permit. The City of Manitowoc agreed to do the following: 1. Perform a phosphorus source identification program within the City.

	2. Perform a phosphorus removal study within the treatment facility. 3. Make changes in the sewer use ordinance to reduce influent phosphorus loadings. 4. Change the fees associated with industrial phosphorus discharge in the sewer use ordinance.
Pollution Prevention Process	By completing a phosphorus removal study and starting a source identification program, the City has been able to implement a phosphorus reduction program and meet their phosphorus effluent limit. A surcharge on industrial phosphorus releases has encouraged costs to be recovered from the sources of phosphorus generation.
Scale of Operation	In 1986, the average daily flow of the Wastewater Treatment Facility was 11.74 million gallons. The average daily influent concentration of phosphorus was 6.91 mg/l, and the average daily effluent concentration of phosphorus was 1.47 mg/l.
Stage of Development	Identification of one major contributor of phosphorus to the collection system was discovered during the phosphorus source identification program. Meetings were held with representatives of the City and this industry to discuss what could be done to reduce their phosphorus loadings to the collection system. The industry installed a pretreatment system and the average daily influent concentration of phosphorus for 1995 has been reduced to 5.2 mg/l and the average daily effluent concentration was 0.7 mg/l.
Level of Commercialization	Any municipality could start a source identification reduction program for any pollutant that has excessive loadings to their collection system.
Material/Energy Balance	***Original Process*** **Feedstock** As part of Manitowoc's phosphorus removal study, the City evaluated the use of pickle liquor, alum, and ferric chloride to treat the phosphorus in their influent. The City determined that ferric chloride was twice as expensive as pickle liquor or alum but would require half the amount of chemical. Ferric chloride also seemed to work better than pickle liquor or alum. Therefore, the City currently uses ferric chloride to treat their wastewater which costs approximately $150,000 per year. **Waste or Disposal** No waste or disposal is associated with the City's treatment of its wastewater using ferric chloride. If the City chose to use pickle liquor it would have to report its use on a Hazardous Waste Annual Report, but would not be charged a generator fee because it would be considered beneficially reused. ***Pollution Prevention Process***

	Feedstock The City found that it could not meet its phosphorus limit by using only pickle liquor, alum, or ferric chloride, and source reduction became the necessary option. **Waste or Disposal** No waste or disposal is associated with the source reduction program.
Economics	The total cost to the City for the phosphorus removal study and the phosphorus source identification program was approximately $6500. The payback was for the City to meet their WPDES Permit limits, which has been accomplished.
Benefits	The results of the phosphorus source identification program showed one industry to be the major contributor of phosphorus to the collection system. By assessing fees to this contributor, the business was motivated to control their discharge and reduce the phosphorus load to the collection system.
Obstacles	Modifying the sewer use ordinance to establish new effluent limits and increased pollutant surcharges may encounter resistance, but if well researched will be effective and equitable.
Technology Transfer	Successful source reduction in one community may be directly applicable to other communities.
Company Address	City of Manitowoc Wastewater Treatment Facility 1015 South Lakeview Drive Manitowoc, Wisconsin 54220
Contact Person	Ron Clish, Superintendent of the Wastewater Treatment Facility 414/683-4516
Pollution Prevention Resources	**Free, On-site Technical Assistance** University of Wisconsin Extension Solid and Hazardous Waste Education Center Milwaukee area: 414/475-2845 Remainder of state: 608/262-0385 **Pollution Prevention Information Clearinghouse** Wisconsin Department of Natural Resources Cooperative Environmental Assistance 608/267-9700 or e-mail: cea@dnr.state.wi.us

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